

IN THE CLAIMS:

The following is a complete listing of the claims, and replaces all earlier version and listings.

1. (original): An image processing apparatus for quantizing multilevel color image data containing at least two kinds of color components, comprising:

error addition means for adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels;

modulation amount determination means for determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

quantization means for acquiring a threshold for each color component from said threshold table in accordance with a combination of color components of the target pixel, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added by said error addition means.

2. (original): The apparatus according to claim 1, wherein said modulation amount determination means determines a threshold modulation amount for each color in accordance with a combination of color component values of the target pixel.

3. (original): The apparatus according to claim 1, wherein said modulation amount determination means determines a threshold modulation amount for each color in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

4. (original): An image processing apparatus for quantizing multilevel color image data containing at least two kinds of color components, comprising:

error addition means for adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

quantization means for quantizing each color component of the target pixel;
and

a diffusion coefficient table which stores a diffusion coefficient for diffusing a quantization error produced by said quantization means, in accordance with a combination of color component values of a pixel,

wherein said error addition means adds an error value to the target pixel in accordance with a combination of color components of the target pixel and a diffusion coefficient selected from said diffusion coefficient table.

5. (original): The apparatus according to claim 4, wherein said error addition means selects a diffusion coefficient from said diffusion coefficient table in accordance with a combination of color component values of the target pixel.

6. (original): The apparatus according to claim 4, wherein said error addition means selects a diffusion coefficient from said diffusion coefficient table in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

7. (original): The apparatus according to claim 4, wherein said error addition means selects a diffusion coefficient from said diffusion coefficient table in accordance with a product of color component values of the target pixel and a neighboring pixel thereof.

8. (original): An image processing apparatus for quantizing multilevel color image data containing at least two kinds of color components, comprising:

error addition means for adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels;

modulation amount determination means for determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel;

quantization means for acquiring a threshold for each color component from said threshold table in accordance with a combination of color components of the target pixel, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added by said error addition means; and

a diffusion coefficient table which stores a diffusion coefficient for diffusing a quantization error produced by said quantization means, in accordance with a combination of color component values of a pixel,

wherein said error addition means adds an error value to the target pixel in accordance with a combination of color components of the target pixel and a diffusion coefficient selected from said diffusion coefficient table.

9. (currently amended): An image processing apparatus for quantizing multilevel color image data containing at least three kinds of color components, comprising:

error addition means for adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels;

modulation amount determination means for determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

quantization means for acquiring a threshold for each color component from said threshold table in accordance with a combination of color components of the target pixel, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added by said error addition means,

wherein a combination of two kinds of color components is quantized by ~~[[an]] said image processing apparatus defined in claim 1,~~ and a remaining color component is quantized ~~by the image processing apparatus defined in claim 1~~ with a value of a color component other than a target color component being regarded as 0.

10. (original): An image processing method of quantizing multilevel color image data containing at least two kinds of color components, comprising:

an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a modulation amount determination step of determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

a quantization step of acquiring a threshold for each color component, in accordance with a combination of color components of the target pixel, from a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added in the error addition step.

11. (original): The method according to claim 10, wherein in the modulation amount determination step, a threshold modulation amount for each color is determined in accordance with a combination of color component values of the target pixel.

12. (original): The method according to claim 10, wherein in the modulation amount determination step, a threshold modulation amount for each color is determined in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

13. (original): An image processing method of quantizing multilevel color image data containing at least two kinds of color components, comprising:

- an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel; and
- a quantization step of quantizing each color component of the target pixel

wherein in the error addition step, an error value is added to the target pixel in accordance with a combination of color components of the target pixel and a diffusion coefficient selected from a diffusion coefficient table which stores a diffusion coefficient for diffusing a quantization error produced in the quantization step, in accordance with a combination of color component values of a pixel.

14. (original): The method according to claim 13, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in accordance with a combination of color component values of the target pixel.

15. (original): The method according to claim 13, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

16. (original): The method according to claim 13, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in

accordance with a product of color component values of the target pixel and a neighboring pixel thereof.

17. (currently amended): An image processing method of quantizing multilevel color image data containing at least two kinds of color components, comprising:

an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a modulation amount determination step of determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

a quantization step of acquiring a threshold for each color component, in accordance with a combination of color components of the target pixel, from a threshold table which stores a quantization threshold for each of the color components, in accordance with a combination of color component values of pixels, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added in the error addition step;

wherein in the error addition step, an error value is added to the target pixel in accordance with a combination of color components of the target pixel and a diffusion coefficient selected from a diffusion coefficient table which stores a diffusion coefficient

for diffusing a quantization error produced in the quantization step in accordance with a combination of color component values of a pixel.

18. (currently amended): An image processing method of quantizing multilevel color image data containing at least three kinds of color components,

comprising:

an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a modulation amount determination step of determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

a quantization step of acquiring a threshold for each color component, in accordance with a combination of color components of the target pixel, from a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added in the error addition step.

wherein a combination of two kinds of color components is quantized by [[an]] said image processing method ~~defined in claim 10~~, and a remaining color component

is quantized by the image processing method defined in claim 10 with a value of a color component other than a target color component being regarded as 0.

Claims 19. - 26. (canceled).

27. (currently amended): A computer-readable medium encoding a computer program product for causing a computer to quantize multilevel color image data containing at least two kinds of color components, said program comprising:

a code for an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a code for a modulation amount determination step of determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

a code for a quantization step of acquiring a threshold for each color component from a threshold table in accordance with a combination of color components of the target pixel, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added in the error addition step.

28. (currently amended): The product medium according to claim 27, wherein in the modulation amount determination step, a threshold modulation amount for

each color is determined in accordance with a combination of color component values of the target pixel.

29. (currently amended): The ~~product~~ medium according to claim 27, wherein in the modulation amount determination step, a threshold modulation amount for each color is determined in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

30. (currently amended): A computer-readable medium encoding a ~~computer~~ program ~~product~~ for causing a computer to quantize multilevel color image data containing at least two kinds of color components, said program comprising:

a code for an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a code for a quantization step of quantizing each color component of the target pixel; and

a diffusion coefficient table,

wherein in the code for the error addition step, a diffusion coefficient is selected, in accordance with a combination of color components of the target pixel, from a diffusion coefficient table which stores a diffusion coefficient for diffusing the quantization error in accordance with a combination of color component values of a pixel, and an error value is added to the target pixel in accordance with the selected diffusion coefficient.

31. (currently amended): The ~~product~~ medium according to claim 30, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in accordance with a combination of color component values of the target pixel.

32. (currently amended): The ~~product~~ medium according to claim 30, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in accordance with a combination of average values, maximum values, or minimum values of color components of the target pixel and a neighboring pixel thereof.

33. (currently amended): The ~~product~~ medium according to claim 30, wherein in the error addition step, a diffusion coefficient is selected from the diffusion coefficient table in accordance with a product of color component values of the target pixel and a neighboring pixel thereof.

34. (currently amended): A computer-readable medium encoding a computer program ~~product~~ for causing a computer to quantize multilevel color image data containing at least two kinds of color components, said program comprising:

a code for an error addition step of adding a quantization error value distributed from a neighboring pixel for each color component to each of a plurality of color components contained in a target pixel;

a code for a modulation amount determination step of determining a threshold modulation amount of each color in accordance with a combination of color component values of pixels including the target pixel; and

a code for a quantization step of acquiring a threshold for each color component, in accordance with a combination of color components of the target pixel, from a threshold table which stores a quantization threshold for each of the color components in accordance with a combination of color component values of pixels, determining a threshold modulated by adding the modulation amount to the threshold for each color, and quantizing the target pixel in accordance with a relationship in magnitude between the modulated threshold and a value of each color component to which an error value is added in the error addition step,

wherein in the code for the error addition step, a diffusion coefficient is selected, in accordance with a combination of color components of the target pixel, from a diffusion coefficient table which stores a diffusion coefficient for diffusing a quantization error in accordance with a combination of color component values of a pixel, and an error value is added to the target pixel in accordance with the selected diffusion coefficient.